CHAPTER 3

PROCEDURE FOR DETERMINING BUILDING FIRE FLOW DEMAND

3-1. General. The following steps are to be used in determining the required fire flow demand. Deviation from these steps may be required depending upon the particular circumstances at the subject facility.

3-2. Step one. Establish building parameters.

a. Item one. Determine the type of construction of the subject facility. Construction can be determined from architectural plans or by inspecting building structural components.

b. Item two. Determine the number of stories in the subject facility. This manual differentiates between single story buildings and multiple story buildings only.

c. Item three. Determine the hazard classification of the subject facility occupancies as defined in the standard design of subject facility.

d. Item four. Determine the floor area of each story of the subject facility.

e. Item five. Determine the distance from the subject facility to each exposed facility. This distance is the shortest distance measured from the subject facility wall to the exposed facility, and rounded to the nearest whole foot. This distance is to be measured for each exposed facility.

f. Item six. Determine if automatic sprinkler or special fire suppression systems are to be installed in the subject facility. If the subject facility will have a complete automatic sprinkler system, skip steps two through seven and go directly to step eight. If a partial sprinkler system or special fire suppression systems are installed, or if no systems are installed, continue to step two.

3-3. Step two. Using the parameters obtained in step one, develop the basic fire flow rate using figures 3-1 and 3-2. Figures 3-1 and 3-2 contain curves to be used with Type V (ordinary, heavy timber, wood frame) construction. Determine the appropriate curve on the figure which is related to subject facility height (single story or multiple story) and hazard classification of the subject facility occupancies (light, ordinary, or extra).

3-4. Step three. Determine the basic fire flow rate from the appropriate curve using the area of the largest floor developed in step one, item four.

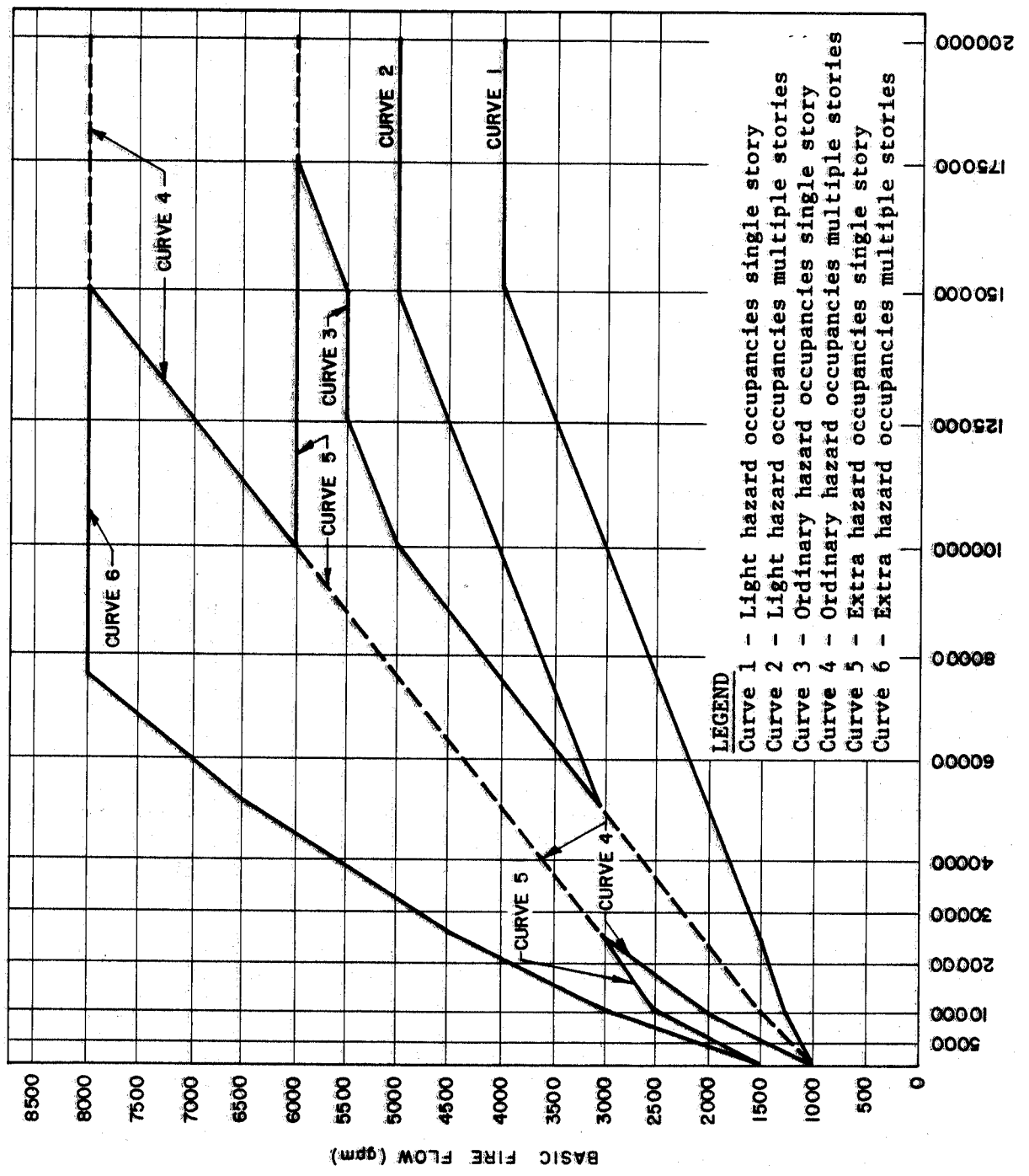

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FIGURE 3-1. TYPE V (COMBUSTIBLE) CONSTRUCTION CURVES
(0 TO 200,000 SQUARE FEET)

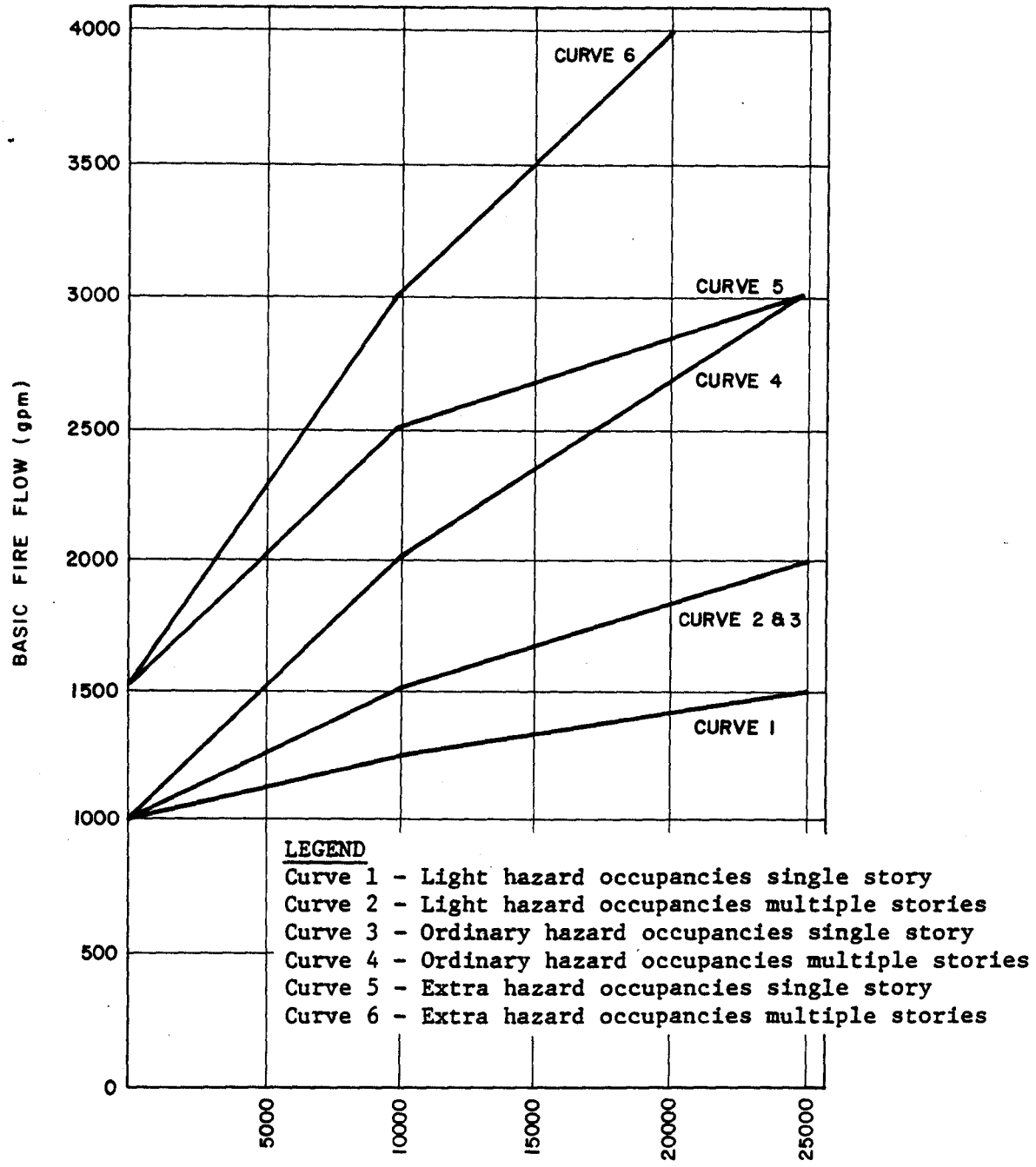

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FIGURE 3-2. TYPE V (COMBUSTIBLE) CONSTRUCTION CURVES (0 TO 25,000 SQUARE FEET)

3-5. Step four. Determine the increase needed for exposure protection.

a. Item one. Determine the separation factor from table 3-1 for each exposed facility, using the distances developed in step one, item five.

Table 3-1. Distance Versus Separation Factor

Separation Distance (in feet)	Separation Factor
0 - 10	5
11 - 25	4
26 - 50	3
51 - 100	2
101 - 150	1
over 150	0

b. Item two. Add the separation factors for all exposed facilities.

c. Item three. Determine the exposure factor from figure 3-3, using the sum of the separation factors calculated in step four, item two. The maximum value of the exposure factor is 1.75, even though the separation factor total may be greater than 15.

d. Item four. Determine the required fire flow rate by multiplying the basic fire flow rate by the exposure factor, rounding to the closest 250 gpm.

3-6. Step five. Determine the required fire flow duration from table 3-2 using the required fire flow rate developed in step four, item four.

Table 3-2. Required Fire Flow Duration

Required Fire Flow gpm	Minimum Duration hours
1,500 or less	2
1,750 - 3,500	3
3,750 or over	4

3-7. Step six. Determine the minimum required residual pressure.

3-8. Step seven. Determine the need for additional water flow rate, duration, or pressure requirements created by use of a partial automatic sprinkler system, or special fire suppression systems in the subject facility.

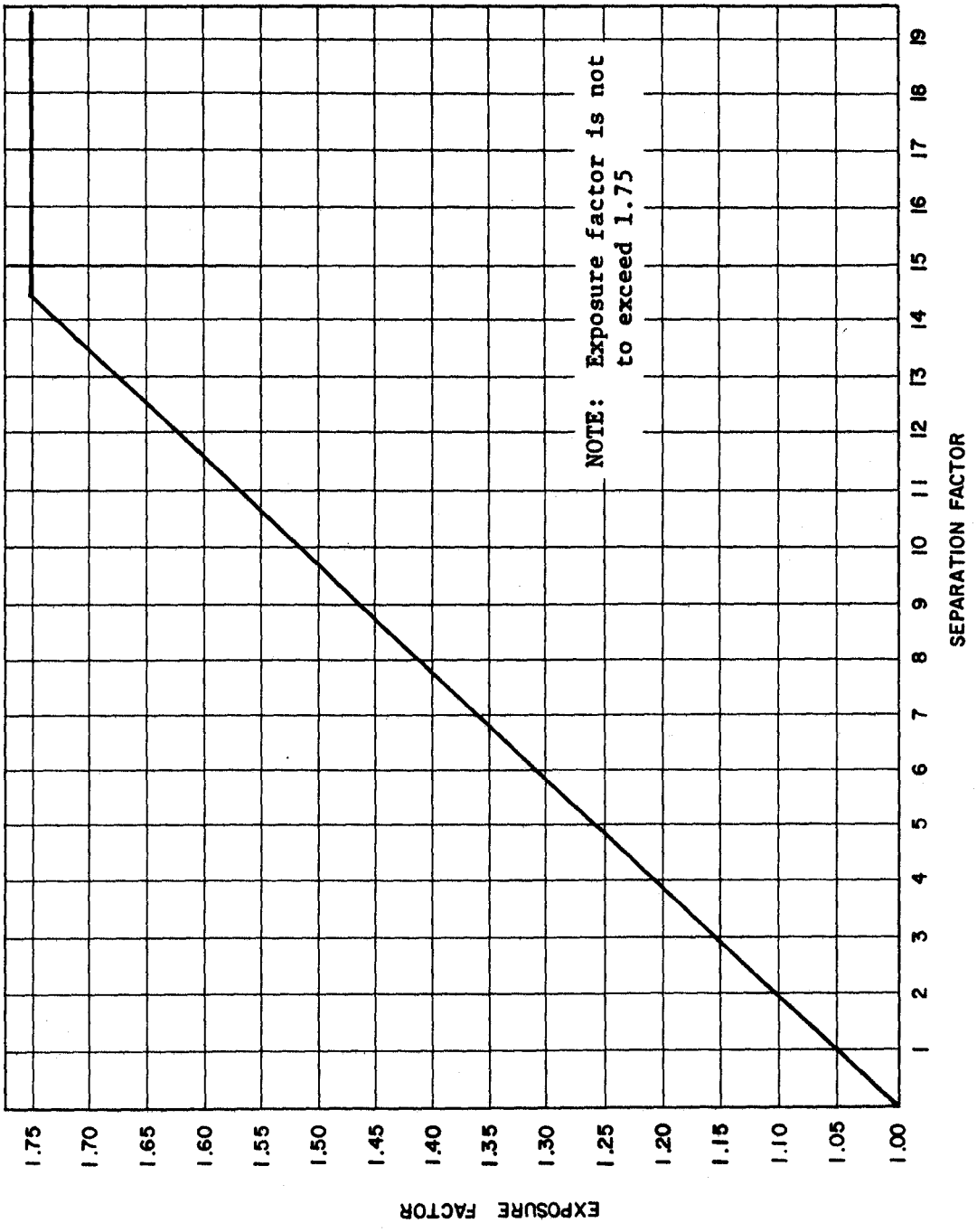

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FIGURE 3-3. EXPOSURE FACTOR CURVE

a. Item one. Determine partial automatic sprinkler system or special fire suppression system water requirements from tables 3-3 and 3-4 and paragraph 1-2.k.

Table 3-3. Water Demands for Sprinklered Facilities

Occupancy classification	Sprinklers: Design density gpm/ft^2	Sprinklers: Design area ft^2	Hose gpm	Duration of supply (minutes)
Light hazard	0.10	3,000	250	45
Ordinary Hazard Group 1	0.15	3,000	500	60
Ordinary Hazard Group 2	0.20	3,000	500	75
Ordinary Hazard Group 3	0.25	3,000	500	90
Extra hazard	0.35	3,000	750	105
Ordnance plants (exposed powder area)	0.50	Entire area	750	45
Missile assembly	0.25	Entire area	500	45

Note: For dry pipe systems, increase design area by 30 percent.

Table 3-4. Water Demands for Rubber Tire Storage

Arrangement	Density gpm/sq. ft.	Area of Demand, sq. ft.: Wet system	Area of Demand, sq. ft.: Dry system
A. On-Side Storage			
1. 5-10 ft high	0.45	3,000	3,900
2. 10-15 ft high	0.60	3,000	3,900
3. Up to 25 ft high	0.60	5,000	6,500
B. On-Tread Storage			
1. 5-8 ft high	0.40	3,000	3,900
2. 8-12 ft high	0.60	3,000	3,900
3. Up to 20 ft high	0.60	5,000	6,500

Note: Hose stream demand is 750 gpm for 180 minutes.

b. Item two. Determine if increases are needed to the required fire flow rate, fire flow duration, or minimum residual pressure.

(1) If the partial automatic sprinkler or special fire suppression system flow rate, residual pressure, and duration are less than those of the required fire flow demand, no adjustment is necessary.

(2) If the partial automatic sprinkler or special fire suppression system fire flow duration requirement is greater than the fire flow duration requirement of the required fire flow demand, the